INSTRUCTIONS: This exam is a **closed book exam**. You may **not** use your text, homework, or other aids except for a 3×5-inch notecard. You may use an allowable calculator, **TI-83 or TI-84** to

- perform operations on real numbers,
- evaluate functions at specific values, and
- examine at graphs and/or tables.

A TI-89, TI-Nspire, or a calculator with a computer algebra system, any technology with wireless or Internet capability (i.e. laptops, tablets, smart phones or watches), a QWERTY keyboard, or a camera are **not allowed**. Unless otherwise stated, you must **show all of your work** including all steps needed to solve each problem and explain your reasoning in order to earn full credit. This means that **correct answers using incorrect reasoning may not receive any credit**. Reasoning which will earn credit will use material covered in the course to date, up to and including Section 3.10.
Turn off all noise-making devices and all devices with an internet connection and put them away. Put away all headphones, earbuds, etc.

This exam consists of 7 problems on 8 pages. Make sure all problems and pages are present.

The exam is worth 75 points in total.

You have **60 minutes** to work starting from the signal to begin. Good luck!

Exam 1 Grade by Problem Number

No.	Out of	Pts.
1	10	
2	8	
3	9	
4	15	
5	15	
6	8	
7	10	
Total	75	

Current Course Grade by Category

Category	Out of	Current
Exam 1	100%	
Exam 2	100%	
WebAssign	100%	
Quiz/HW	100%	
Overall 10 Week Grade	100%	

1. (*2 points each*) Answer the following multiple choice questions by circling your answer. **No justification or explanation is required**.

   (i) Evaluate $\lim_{h\to 0} \dfrac{\cos\left(\frac{\pi}{2}+h\right)-\cos\left(\frac{\pi}{2}\right)}{h}$.

   a. 0
   b. 1
   c. -1
   d. π
   e. $-\pi$

   (ii) If $f(x)=5^x$, then $f^{(4)}(x)$ is equal to

   a. $x(x-1)(x-2)(x-3)\cdot 5^{(x-4)}$
   b. $(5^x)^4$
   c. $5^x \ln(5)$
   d. $5^x\,(\ln(5))^4$
   e. $4\,(5^x)^3$

   (iii) If f is a differentiable function, then $\dfrac{d}{dx}\left(x\cdot f(x^2)\right) =$

   a. $f(x^2)+2x^2f'(x^2)$
   b. $f'(2x)$
   c. $f'(x^2)\cdot 2x$
   d. $f'(3x^2)$
   e. $f(x^2)+x\cdot f'(x^2)$

   (iv) The equation of the line tangent to the graph of $f(x)=\sin(x)$ when $x=\dfrac{\pi}{6}$ is

   a. $y=-\dfrac{\sqrt{3}}{2}\left(x-\dfrac{\pi}{6}\right)-\dfrac{1}{2}$
   b. $y=-\cos(x)\left(x-\dfrac{\pi}{6}\right)+\dfrac{\sqrt{3}}{2}$
   c. $y=\dfrac{1}{2}\left(x-\dfrac{\pi}{6}\right)+\dfrac{\sqrt{3}}{2}$
   d. $y=\cos(x)\left(x+\dfrac{\pi}{6}\right)+\dfrac{1}{2}$
   e. $y=\dfrac{\sqrt{3}}{2}\left(x-\dfrac{\pi}{6}\right)+\dfrac{1}{2}$

(v) A rock is thrown into a pond creating a circular ripple. Which of the following equations expresses the relationship between the rate of change of the radius r of the circular ripple (with respect to time) and the rate of change of its area A (with respect to time)?

a. $\dfrac{dA}{dt} = 2\pi r$

b. $A = \pi r^2$

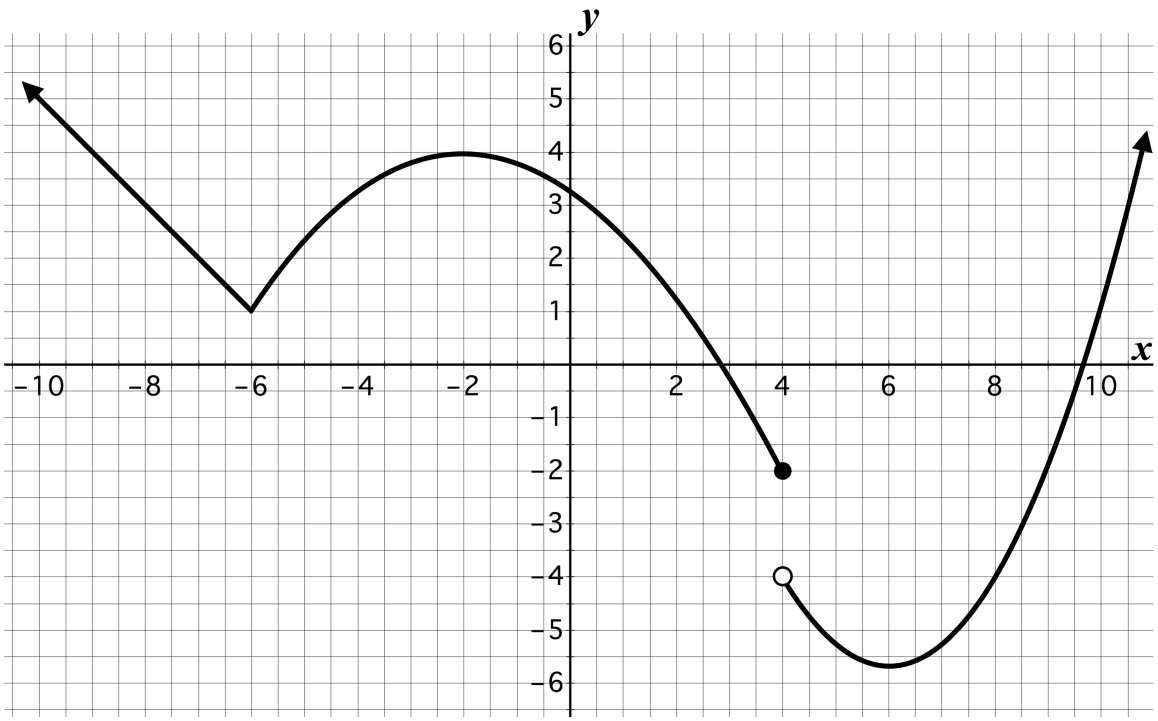
c. $\dfrac{dA}{dt} = 2\pi r \cdot \dfrac{dr}{dt}$

d. $C = 2\pi r$

e. $\dfrac{dA}{dt} = r^2 + 2\pi r \cdot \dfrac{dr}{dt}$

2. (*8 points*) The linear function L is tangent to the graph of $f(x) = \sqrt{x+2}$. Suppose the slope of L is $\frac{1}{2}$. Find the coordinates of the point of tangency.

3. (*9 points*) Given the graph of $y = f(x)$, determine the following, if they exist. (Assume that the end behavior of f is as indicated.)



(a) (*2 points*) Determine all values of x for which $f'(x) = 0$.

(b) (*2 points*) Determine all values of x for which $f'(x)$ is undefined.

(c) (*5 points*) Define $g(x) = \dfrac{f(x)}{2(x+6)}$ where f is as above. Find $g'(-8)$.

4. (*5 points each*) Use the table of values below to answer the following questions. State your answers as exact values.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	4	-1	3	6
2	2	1	3	-4
4	-3	1	5	-2

(a) If $k(x) = g\left(f(x)\right)$, then $k'(1) =$

(b) If $s(x) = \tan^{-1}\left(f(2x)\right)$, then $\left.\dfrac{ds}{dx}\right|_{x=2} =$

(c) If $j(x) = x \cdot \ln\left(g(x)\right)$, then $j'(4) =$

5. (*5 points each*) Compute the following derivatives. Do not simplify.

   (a) Let $g(t) = t \cdot e^{\sin(t)}$. Find $g'(t)$.

   (b) Let $y = \sec(\sqrt{x})$. Find $\dfrac{dy}{dx}$.

   (c) Let $f(x) = \dfrac{\pi^x}{x^\pi}$. Find $f'(x)$.

6. (*8 points*) Find $\dfrac{dy}{dx}$ for the curve $y + \cos(x) = \sin(y)$. You must solve for $\dfrac{dy}{dx}$ in terms of x and y.

7. (*10 points*) Pistol Pete has been seen leaving an intersection heading due west in an orange pickup truck. A police car is parked 0.1 mile due south of the intersection. When the distance between the stationary police car and the moving orange truck is 0.6 mile, the distance between the police car and the truck is increasing at a rate of 50 miles per hour. How fast is Pistol Pete driving at this time? (Express your solution accurate to three decimal places.)